All stages between the juvenile type with the solid stele and the adult type may occur; cases of reduction of steles of the adult type to the juvenile condition are described. These variations are held to be dependent upon physiological factors; the solid stele of the juvenile type is considered to be merely a physiological variation of the general type of the species.

The outer xylem of the leaf trace, after separation from the stele, curves round the protoxylem strand; at the same time, the trace, originally monarch, becomes diarch by the division of the protoxylem strand. These two processes result in the formation of a trace whose cross-section shows two protoxylem points, each surrounded by metaxylem. This "clepsydroid" stage of the leaf trace is characteristic of certain of the Zygopterideae and affords data for a comparison with that group.

The branches develop from the vestigial axillary buds. There is no vascular connection between the branch stele and the leaf trace immediately below, as in some species of *Botrychium*. Immediately below the point of origin of a branch, accessory xylem is developed by irregular divisions of the parenchyma within the phloem. While no cambium is present, this is considered to be a form of secondary thickening. In the base of the branch this accessory xylem surrounds an extension of the inner metaxylem of the main axis, thus forming a solid xylem strand which is in all respects similar to the steles of rhizomes of young plants. The further development of the branch stele is identical with that of steles of young plants.

The mesarch character of the stele, the clepsydroid stage of the leaf trace, the irregular secondary thickening of the stele, and the connection of the branch stele with the main axis rather than with the leaf trace, all emphasize the view of relationship of the Ophioglossaceae to the Zygopterideae. It is further pointed out that these features also afford a basis for comparison with certain of the Cycadofilicales.—L. C. PETRY.

Origin of dwarf plants.—STOUT[12] has described a dwarf form of *Hibiscus oculiroseus* which differs from the usual robust type in having more basal branches, shorter internodes, and smaller, somewhat crinkled and irregular leaves. The dwarfs are descendants of a single robust plant with some crinkled leaves and somewhat shortened upper internodes, a type known as "intermediate." Four other plants have given none but normal robust offspring, something over 100 in all. Selfed seed from the intermediate plant produced 45 plants, all dwarf. Open-pollinated seed from the same plant yielded one dwarf, 3 intermediates, and 11 robust plants. From selfed seed of one robust plant, there were grown one intermediate and 33 robust plants. Selfed seed of the one dwarf plant produced one robust, 8 intermediate, and 72 dwarf plants, the robust plant being apparently an accidental hybrid. These results are compared with the behavior of dwarfs of *Oenothera*, peas, and sweet

[12] STOUT, A. B., The origin of dwarf plants as shown in a sport of *Hibiscus oculiroseus*. Bull. Torr. Bot. Club **42**:429–450. 1915.

peas. The author emphasizes the fact that in the dwarf *Hibiscus*, as well as in dwarfs of other plants, numerous characters besides stature are modified, and expresses doubt concerning the possibility of interpreting such phenomena as due to a change in a single hereditary unit. The reviewer is inclined to suggest that, until there are available adequate data derived from crosses between the new and the normal types, little is to be gained by the assumption of either single or plural genetic changes, or indeed by a discussion of any other hypothesis.—R. A. EMERSON.

Growth of sugar cane.—KUYPER[13] has investigated the growth of the leaf blade, leaf sheath, and stalk of sugar cane. His method was to make some holes (with a darning needle) through the young leaves and internodes. The distance between holes was made as uniform as possible; in practice the spacing could not be much less than a centimeter. After several days the leaves were removed, one after the other, and the distance between the holes measured. By comparing these measurements, the rate of growth of an area on different parts of the leaf, and on different leaves, can be determined. The results indicated that the region of most rapid growth moves basipetally over the blade, then over the sheath, and finally over the internode. The region near the base continues its growth after the regions above have completed their development. These conclusions were confirmed by measurements obtained from equally spaced lines of India ink, and also by cell measurements. Regarding an internode bearing a leaf at its summit as the unit of structure, it may be said that the blade first becomes fully grown, then the sheath follows, and finally the internode develops. KUYPER shows how these conclusions may be applied in studying the "top rot" disease of Java. The cause of the disease must be sought in temporary unfavorable conditions of growth, and this investigation furnishes a method of recognizing the period of growth influenced by these conditions.—J. M. C.

Stomata of sugar cane.—KUYPER[14] in connection with an investigation of the transpiration of sugar cane discovered a lack of knowledge of the structure of the stomata. Several methods were tried for measuring the width of the stomatal cleft. Direct measurements with the microscope proved impossible, not only because it is very difficult to make good preparations of the leaf for this purpose, but also because the variations in the opening are very small. Since, however, the application of the infiltration method of Miss E. STEIN showed that great variations really exist in the rapidity with which paraffin and kerosene penetrate the leaf tissue, it was clear that there must be something in the structure of the stoma which could explain this variation. The

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[13] KUYPER, J., De groei van bladschyf, bladscheede, en stengel van het suikerriet. Archief voor de Suikerindustrie in Nederlandsch Indië **23**:528–540. *pls. 2.* 1915.

[14] KUYPER, J., De bouw der huifmondjes van het suikerriet. Archief voor de Suikerindustrie in Nederlandsch Indië **22**:1679–1707. *figs. 6.* 1914.